

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



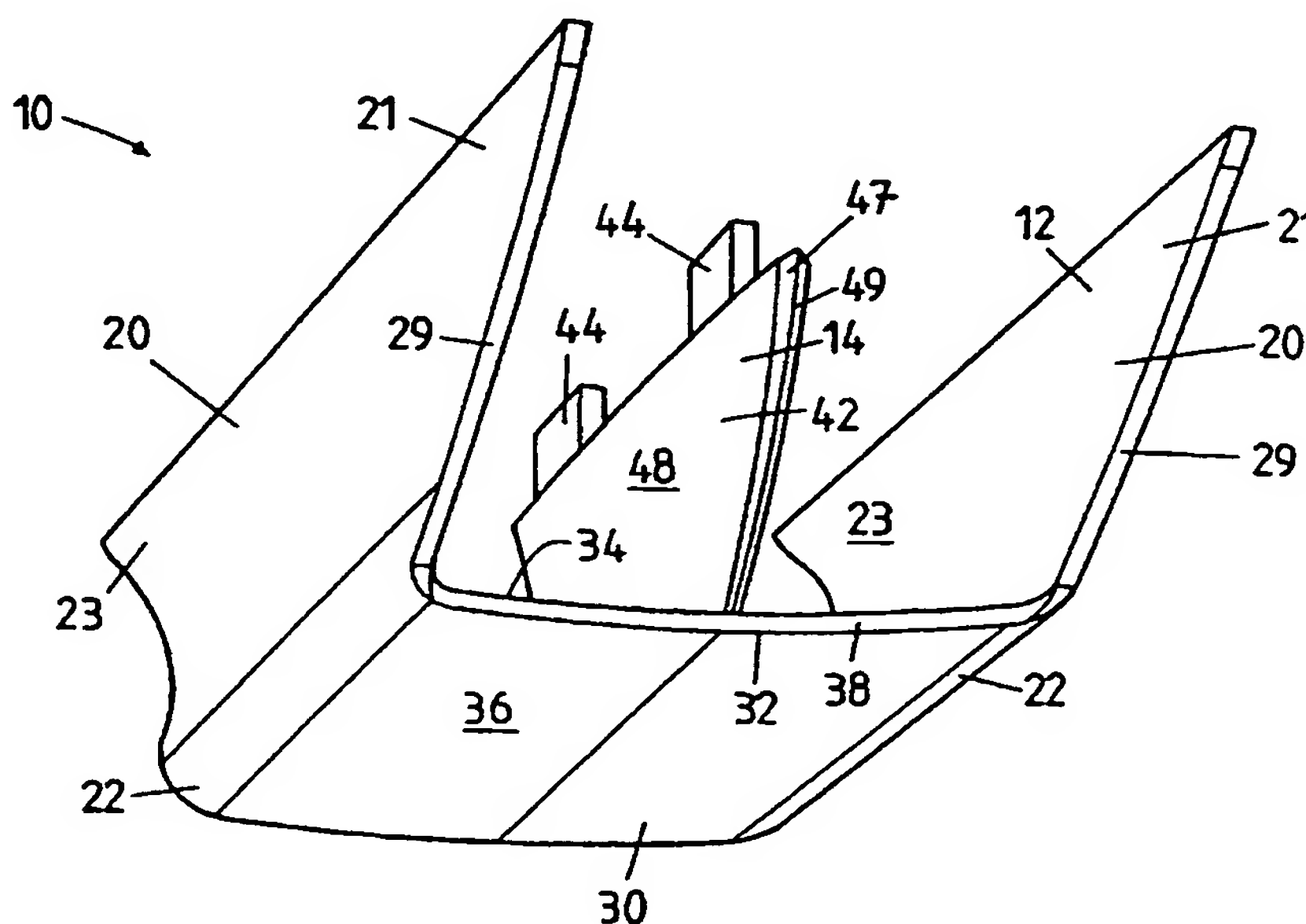
(43) International Publication Date
23 August 2001 (23.08.2001)

PCT

(10) International Publication Number
WO 01/60690 A1

- (51) International Patent Classification⁷: **B63B 35/79**
- (21) International Application Number: **PCT/AU01/00144**
- (22) International Filing Date: 15 February 2001 (15.02.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
PQ 5692 18 February 2000 (18.02.2000) AU
- (71) Applicants and
(72) Inventors: **BURNS, Steve, Daniel** [AU/AU]; 70 Gooseberry Hill Road, Gooseberry Hill, W.A. 6076 (AU). **SALISBURY, James, Edward** [AU/AU]; 16 Pengana Crescent, Mollymook, NSW 2539 (AU).
- (74) Agent: **TURONEK, Mary, Louise**; Lord & Company, 4 Douro Place, West Perth, W.A. 6005 (AU).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: HYDRODYNAMIC DEVICE



(57) Abstract: A hydrodynamic device for use with a water vessel, such as a surfboard, to disrupt a flow of water under the water vessel. The hydrodynamic device comprises a channel member (12) fixed to an underside of the water vessel with an attachment means (14). The attachment means (14) may be a plurality of lugs (44) arranged to be received in corresponding recesses in the underside of the water vessel. In use, water flowing between the underside of the vessel and the channel member (12) passes from a high water pressure zone to a low water pressure zone thereby enhancing a forward thrust of the water vessel in the water.

WO 01/60690 A1

TITLE

“HYDRODYNAMIC DEVICE”

FIELD OF THE INVENTION

5 The present invention relates to a hydrodynamic device, in particular for use with water vessels.

BACKGROUND OF THE INVENTION

Most recreational water vessels, such as surfboards, bodyboards, windsurfers and the like rely on at least one fin attached to an underside of the water vessel to provide stability to the water vessel when it is in use. Developments in the shape and structure
10 of such fins have gradually improved the performance of these vessels, but few fin designs have enhanced the thrust and turning or steering ability of these vessels in the water.

The present invention seeks to overcome at least some of the aforementioned disadvantages.

15 **SUMMARY OF THE PRESENT INVENTION**

In accordance with one aspect of the present invention there is provided a hydrodynamic device for use with a water vessel, comprising a channel member for disrupting a flow of water under the water vessel, the channel member being arranged, in use, to be fixed to an underside of the water vessel with an attachment means,
20 wherein water flowing between the underside of the vessel and the channel member passes from a high water pressure zone to a low water pressure zone thereby enhancing a forward thrust of the water vessel in the water.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described, by way of example only, with reference
25 to the accompanying drawings, in which:-

Figure 1 is a perspective view of a hydrodynamic device in accordance with the present invention;

Figure 2 is a side elevatory view of the hydrodynamic device shown in Figure 1;

Figure 3 is a plan view of the hydrodynamic device shown in Figures 1 and 2;

5 Figure 4 is a front view of the hydrodynamic device shown in Figures 1, 2 and 3;

Figure 5 is a perspective view of a further embodiment of a hydrodynamic device shown in accordance with the present invention;

Figure 6 is a side elevatory view of the hydrodynamic device shown in Figure 5;

Figure 7 is a plan view of the hydrodynamic device shown in Figures 5 and 6; and

10 Figure 8 is a front view of the hydrodynamic device shown in Figures 5, 6 and 7.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In Figures 1-8 of the accompanying Figures, there is shown a hydrodynamic device 10. The hydrodynamic device 10 is arranged, in use, to be fixed to an underside of a water vessel. In particular, the hydrodynamic device 10 is arranged, in use, to be fixed
15 to the underside of recreational water vessels, preferably surfboards, bodyboards, windsurfers and the like. It is envisaged that the hydrodynamic device 10 will replace a conventional fin on the water vessel.

The hydrodynamic device 10 includes a substantially U-shaped channel member 12 and an attachment means 14 for fixing the channel member 12 to the underside of the
20 vessel. The channel member 12 is longitudinally aligned with and equidistantly spaced from opposing sides of the vessel. The channel member 12 is fixed at any point, including and between, a first point disposed substantially equidistantly spaced from a front end and a rear end of the underside of the vessel and a second point disposed adjacent to the rear end of the underside of the vessel.

The U-shaped channel member 12 includes a pair of opposing side walls 20 and a lower wall 30 interconnecting with, and spanning, a lower portion 22 of each side wall 20. Preferably, the side walls 20 and the lower wall 30 are cambered.

As shown in Figures 2 and 6, each side wall 20 has a fin-like profile. The side wall 20 has an upper side 26 disposed parallel with a lower side 24. However, a foremost portion 21 of the upper side 26 extends further forward than a foremost portion 25 of the lower side 24, such that a front side 28 of the side wall 20 is rearwardly and downwardly inclined. Preferably, the front side 28 is slightly convex. A front surface 29 of the side wall 20 tapers slightly towards the lower portion 22 of the side wall 20.

A rear side 82 of the side wall 20 is provided with a first convex portion 62 disposed adjacent to a rearmost portion 27 of the lower side 24, a second convex portion 64 disposed adjacent to a rearmost portion 23 of the upper side 26, and a concave portion 66 disposed intermediate the first and second convex portions 62, 64. The rearmost portion 23 of the upper side 26 extends further rearward than the rearmost portion 27 of the lower side 24, such that the rearmost portion 23 overhangs the lower wall 30, as shown in Figures 2, 3, 6 and 7.

It can also be seen from Figures 3, 4, 7 and 8 that the foremost portions 21, 25, and in particular the foremost portion 21 of the upper side 22, are curved slightly inwardly towards the corresponding foremost portions 21, 25 of the opposing side wall 20. In this way, a front opening 18 of the channel member 12 is narrower than a rear opening 19 of the channel member 12.

Although the lower wall 30 of the channel member 12 is substantially rectangular, it will be evident from Figures 1, 3, 5 and 7 that a front side 32 of the lower wall 30 is slightly concave. Furthermore, an upper surface 34 of the lower wall 30 overhangs the lower surface 36 of the lower wall 30 at the front side 32 of the lower wall 30, such

that a front surface 38 of the lower wall 30 inclines rearwardly of the upper surface 34.

The attachment means 14 shown in Figures 1-4 comprises a central wall 42 and a plurality of lugs 44 upwardly depending from an upper surface 41 of the central wall 42. Each lug 44 is arranged, in use, to be received in a corresponding recess (not shown) disposed in the underside of the water vessel.

A lower surface 43 of the central wall 42 is integral with the lower wall 30 of the channel member 12. The central wall 42 is disposed substantially parallel with and equidistantly spaced from the side walls 20 of the channel member 12. A front portion 45 of the central wall 42 projects increasingly forwardly from the lower wall 30, as shown in Figures 1 and 3, such that a front surface 47 of the front portion 45 is upwardly curved and overhangs the lower wall 30. The front surface 47 is also tapered to a sharp outwardly extending front edge 49. Opposing surfaces 48 of the central wall 42 are slightly convex and taper slightly from the upper surface 41 to the lower surface 43 of the central wall 42.

The hydrodynamic device 10 shown in Figures 5-8 is not provided with a central wall 42 and a plurality of lugs 44 to fix the device 10 to the underside of a vessel. Instead, the device is fixed to the underside of the vessel in a desired location by applying a resin mixture to the upper surfaces 33 of the side walls 20 by known means such that the channel member 12 becomes "glassed-on" to the underside of the vessel.

It will be understood that the attachment means may also comprise a snap-lock fitting device, an adhesive or any other known conventional means by which a fin may be attached to the underside of the vessel in the desired location.

Referring to Figures 5-8, the channel member 12 is provided with a harmonic damper 16 for dampening vibrations which disrupt the performance of the water vessel in the

water. The harmonic damper 16 includes two opposing ribs 52 longitudinally disposed on the upper surface 34 of the lower wall 30. A foremost portion 54 of the ribs 52 protrude forwardly from the front side 32 of the lower wall 30.

The harmonic damper 16 also includes a curved member 56 disposed between the ribs 52 and adjacent to the front side 32 of the lower wall 30. Preferably, the curved member 56 is attached to the lower surface 36 of the lower wall 30. It is envisaged that the curved member 56 will have a very thin thickness, and thus the curved member 56 will be only slightly raised from the lower surface 36.

It is envisaged that the hydrodynamic device 10 will be formed from a low friction material, preferably selected from a group including but not limited to acrylic, glass, carbonite, polyurethane, plastics, nylon, carbon fibre, teflon, and synthetic skin.

It is also envisaged that the hydrodynamic device weighs between 80g - 150g.

Preferably, an outer surface of the hydrodynamic device 10, comprising the lower surface 36 of the lower wall 30 and the respective outer surfaces of the side walls 20, is a polished surface.

Preferably, an inner surface of the hydrodynamic device 10, comprising the upper surface 34 of the lower wall 30, the respective inner surfaces of the side walls 20, and the opposing surfaces 48 of the central wall 42, is a matte surface. However, it is envisaged that the inner surface may also be a polished surface.

In use, the hydrodynamic device 10 is fixed to the underside of water vessel by engaging the lugs 44 depending from central wall 42 in corresponding recesses located in the vessel. Alternatively, the upper surfaces 23 of the side walls 20 of the channel member 12 may be "glassed on" to said underside. It is envisaged that any one of several known attachment means may be adapted to fix the device 10 to the desired location on the vessel.

The device 10 becomes submerged in water when the underside of the vessel partially submerged in, or is disposed on the surface of, a body of water.

A portion of water moving relative to the inner surface of the channel member 12 will pass through a high pressure zone as it enters the front opening 18 of the channel member 12. The high pressure zone is located adjacent to the front surfaces 29 of the side walls 20 and the front surface 38 of the lower wall 30.

Similarly, that same portion of the channel member 12 will pass through a low pressure zone as it exits the rear opening 19 of the channel member 12. The low pressure zone is located adjacent the inwardly curved portions 66 of the rear sides 82 of the side walls 20.

The combined effect of the high pressure zone and the low pressure zone located at respective front and rear openings 18, 19 in the channel member 12, and the cambered side walls 20 and the cambered lower wall 30, is to exert decreasing pressure on the portion of water moving from the front to the rear openings 18, 19 of the channel member 12 relative to the device 10. Water enclosed between the device 10 and the underside of the vessel thus behaves as if it is moving in an expansion chamber, resulting in production of water turbulence and thereby the production of forward thrust to the vessel.

Modifications and variations as would be apparent to a skilled addressee are deemed to be within the scope of the present invention.

CLAIMS

1. A hydrodynamic device for use with a water vessel, comprising a channel member for disrupting a flow of water under the water vessel, the channel member being arranged, in use, to be fixed to an underside of the vessel with an attachment
5 means, wherein water flowing between the underside of the vessel and the channel member passes from a high water pressure zone to a low water pressure zone thereby enhancing a forward thrust of the water vessel in the water.
2. The hydrodynamic device according to claim 1, characterised in that the channel member is substantially U-shaped, the channel member including a pair of
10 opposing side walls and a lower wall interconnecting with, and spanning a lower portion of each side wall.
3. The hydrodynamic device according to claim 2, characterised in that the side walls and the lower wall are cambered.
4. The hydrodynamic device according to claim 2 or claim 3, characterised in
15 that each side wall has a fin-like profile.
5. The hydrodynamic device according to any one of claims 2 to 4, characterised in that a front side of each side wall is rearwardly and downwardly inclined.
6. The hydrodynamic device according to claim 5, characterised in that the front side of each side wall is slightly convex.
- 20 7. The hydrodynamic device according to any one of claims 2 to 6, characterised in that a rear side of each side wall is provided with a first convex portion disposed in a lowermost location of the rear side, a second convex portion disposed in an uppermost location of the rear side, and a concave portion disposed intermediate the first and second convex portions.

8. The hydrodynamic device according to claim 7, characterised in that the second convex portion overhangs the lower wall of the channel member.

9. The hydrodynamic device according to any one of claims 1 to 8, characterised in that a front opening of the channel member is narrower than a rear opening of the channel member

10. The hydrodynamic device according to any one of claims 2 to 9, characterised in that a foremost portion of each side wall is curved slightly inwardly towards a corresponding foremost portion of the opposing side wall.

11. The hydrodynamic device according to any one of claims 2 to 10, characterised in that a front side of the lower wall is slightly concave.

12. The hydrodynamic device according to claim 11, characterised in that an upper surface of the lower wall overhangs the lower surface of the lower wall at the front side of the lower wall, such that a front surface of the lower wall inclines rearwardly of the upper surface.

13. The hydrodynamic device according to any one of claims 1 to 12, characterised in that the channel member is longitudinally aligned with and equidistantly spaced from opposing sides of the vessel.

14. The hydrodynamic device according to any one of claims 1 to 13, characterised in that the channel member is fixed at any point including and between a first point disposed substantially equidistantly spaced from a front end and a rear end of the underside of the vessel and a second point disposed adjacent to the rear end of the underside of the vessel.

15. The hydrodynamic device according to any one of claims 1 to 14, characterised in that the device is formed from a low friction material.

16. The hydrodynamic device according to claim 15, characterised in that the low friction material is selected from a group including but not limited to acrylic, glass, carbonite, polyurethane, plastics, nylon, carbon fibre, teflon, and synthetic skin.

17 The hydrodynamic device according to any one of claims 1 to 16,
5 characterised in that an outer surface of the device is a polished surface.

18. The hydrodynamic device according to any one of claims 1 to 17, characterised in that an inner surface of the device is a matte surface.

19. The hydrodynamic device according to any one of claims 2 to 18, characterised in that the attachment means comprises a central wall disposed
10 substantially parallel with and equidistantly spaced from the side walls of the channel member, and a plurality of lugs upwardly depending from the central wall, wherein each lug is arranged, in use, to be received in a corresponding recess disposed in the underside of the vessel.

20. The hydrodynamic device according to claim 19, characterised in that the
15 central wall projects forwardly of the lower wall of the channel member.

21. The hydrodynamic device according to claim 19 or claim 20, characterised in that a front surface of the central wall is tapered to a sharp outwardly extending front edge.

22 The hydrodynamic device according to any one of claims 19 to 21,
20 characterised in that opposing surfaces of the central wall are slightly convex and taper slightly from an uppermost portion of the central wall to a lowermost portion of the central wall.

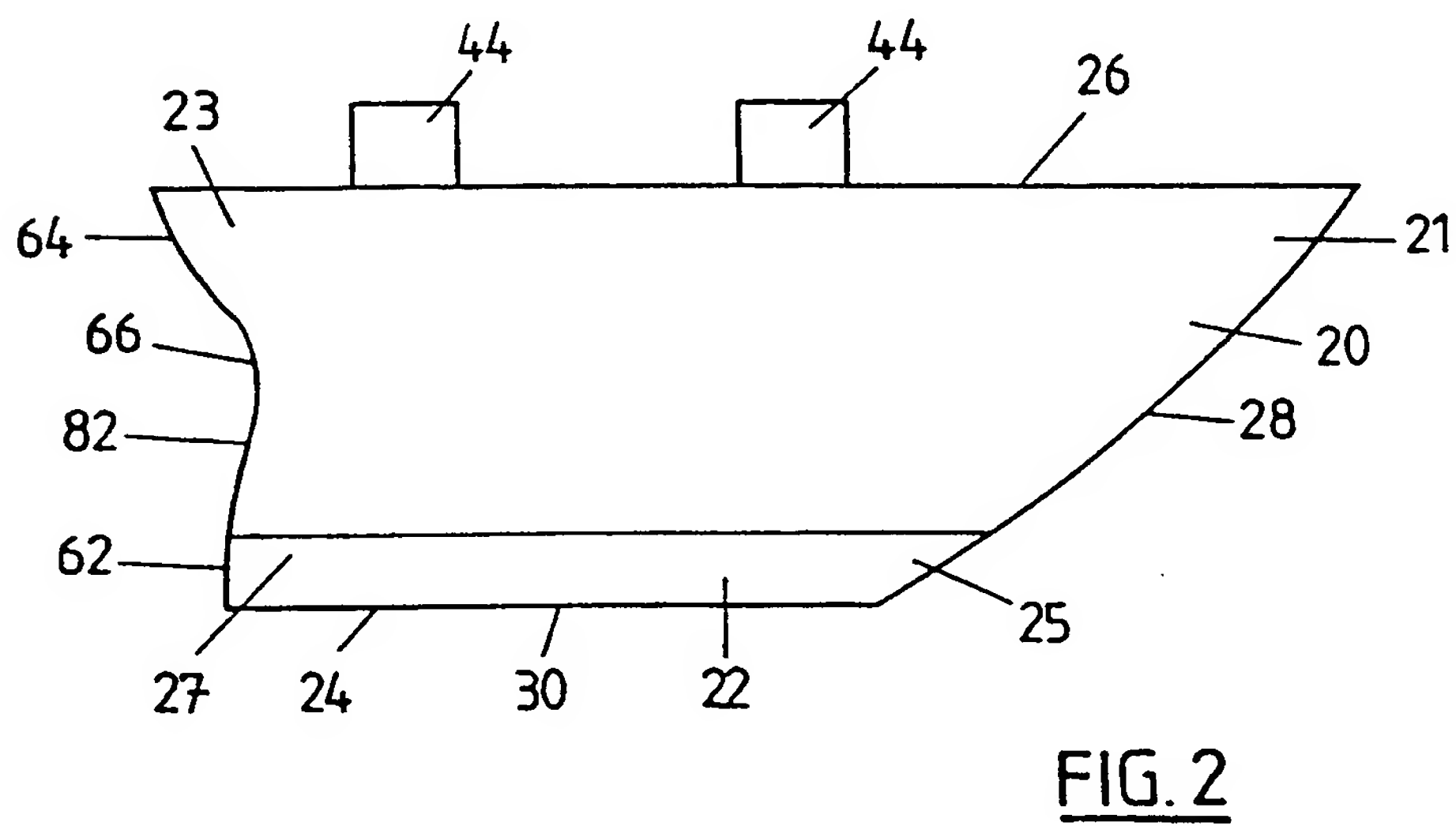
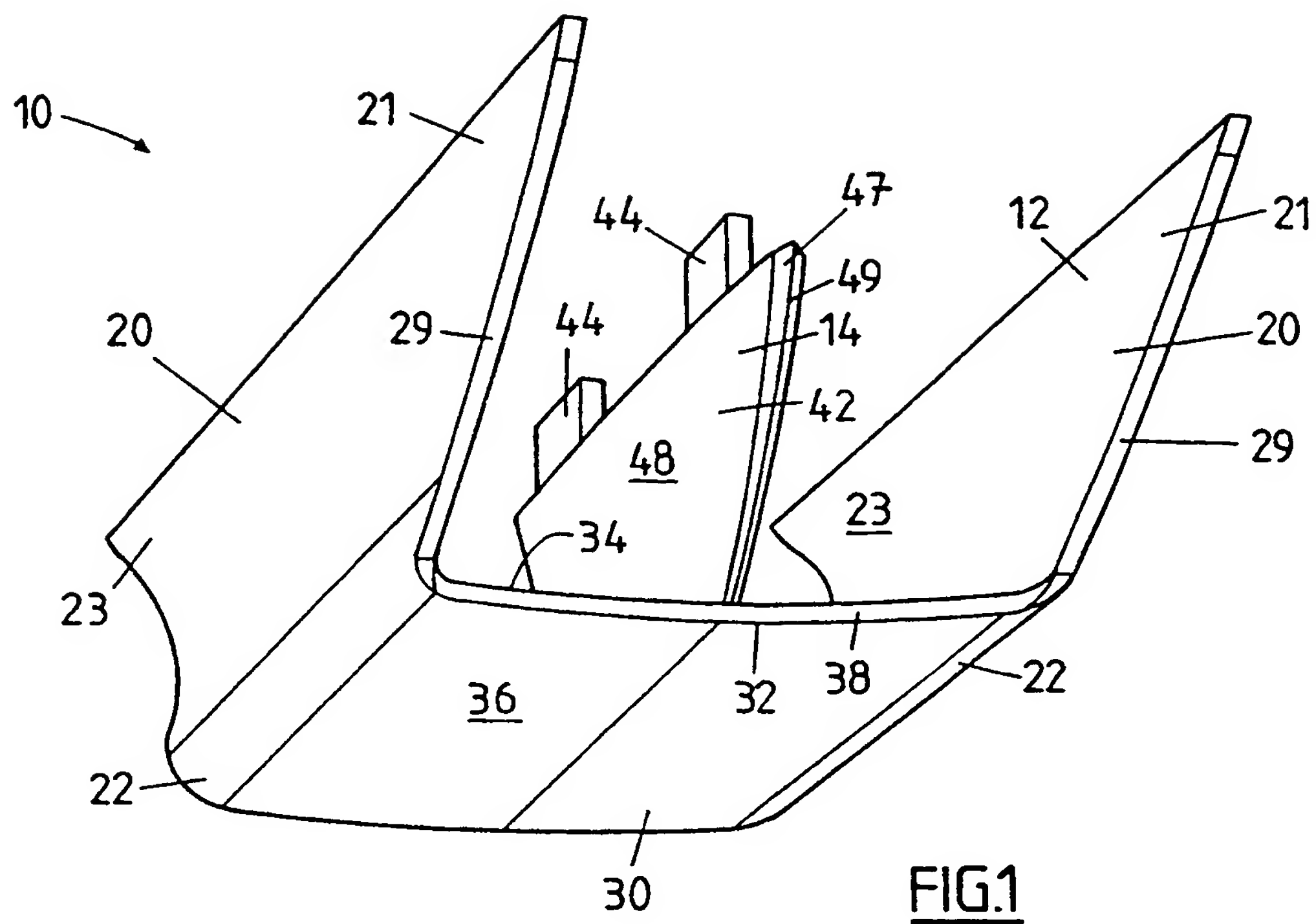
23. The hydrodynamic device according to any one of claims 1 to 22, characterised in that the channel member is provided with a harmonic damper for
25 dampening vibrations.

24. The hydrodynamic device according to claim 23, characterised in that the harmonic damper includes two opposing ribs longitudinally disposed on an upper surface of the lower wall of the channel member.

25. The hydrodynamic device according to claim 24, characterised in that a
5 foremost portion of the ribs protrude forwardly from the front side of the lower wall of the channel member.

26. The hydrodynamic device according to claim 24 or claim 25, characterised in that the harmonic damper further includes a curved member disposed between the ribs and adjacent to the front side of the lower wall.

10 27. The hydrodynamic device according to claim 26, characterised in that the curved member is attached to the lower surface of the lower wall.



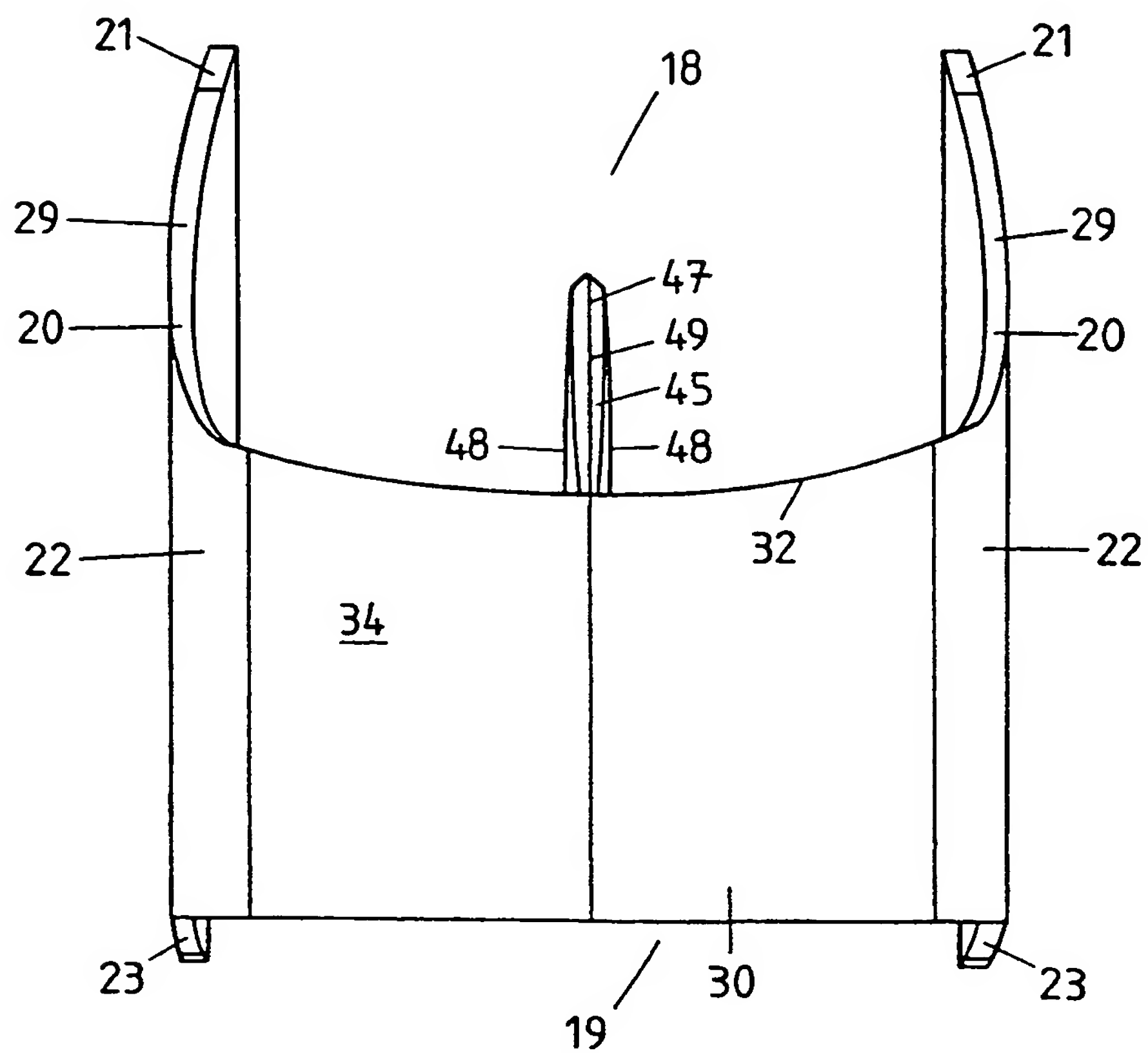


FIG.3

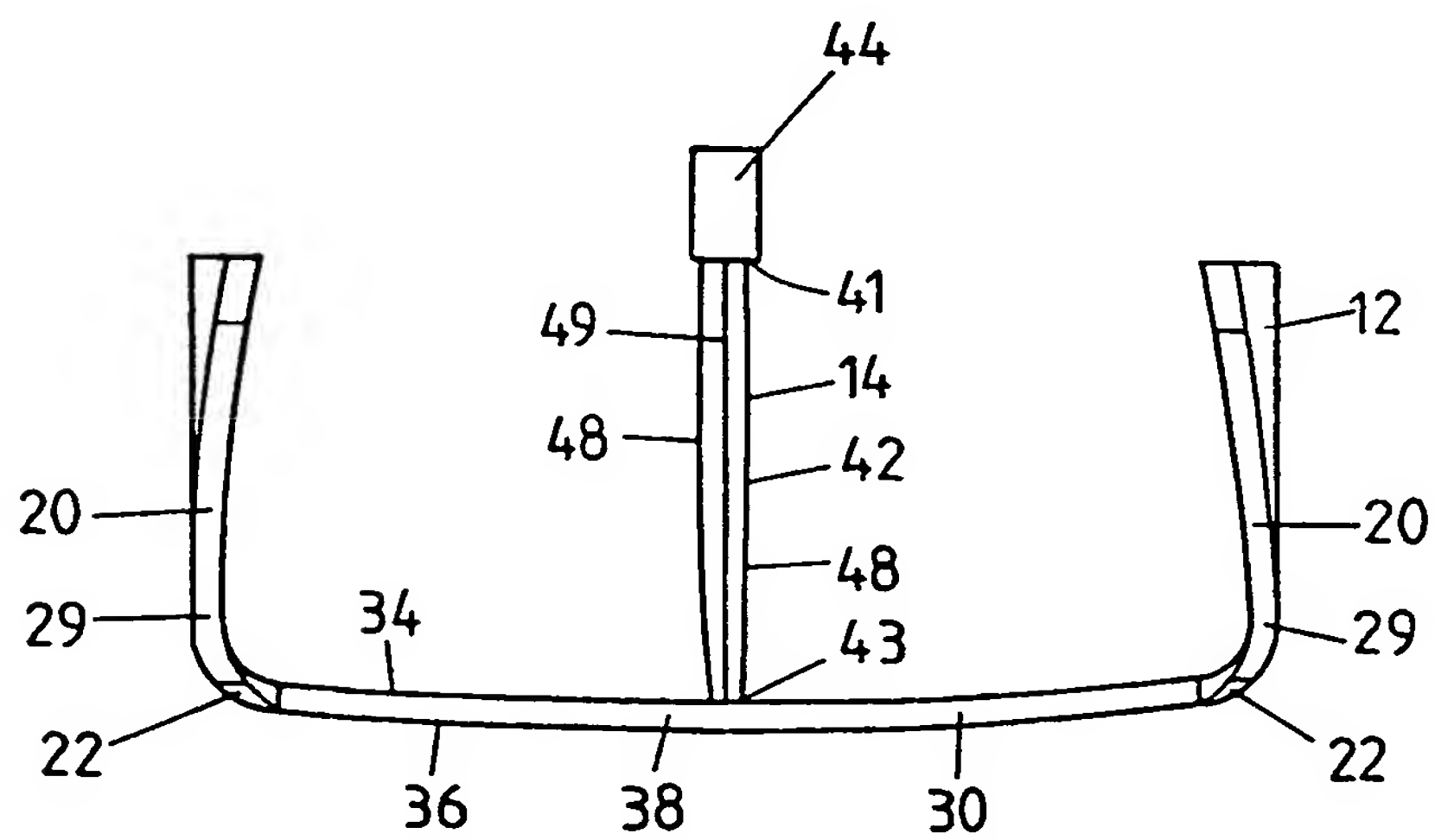
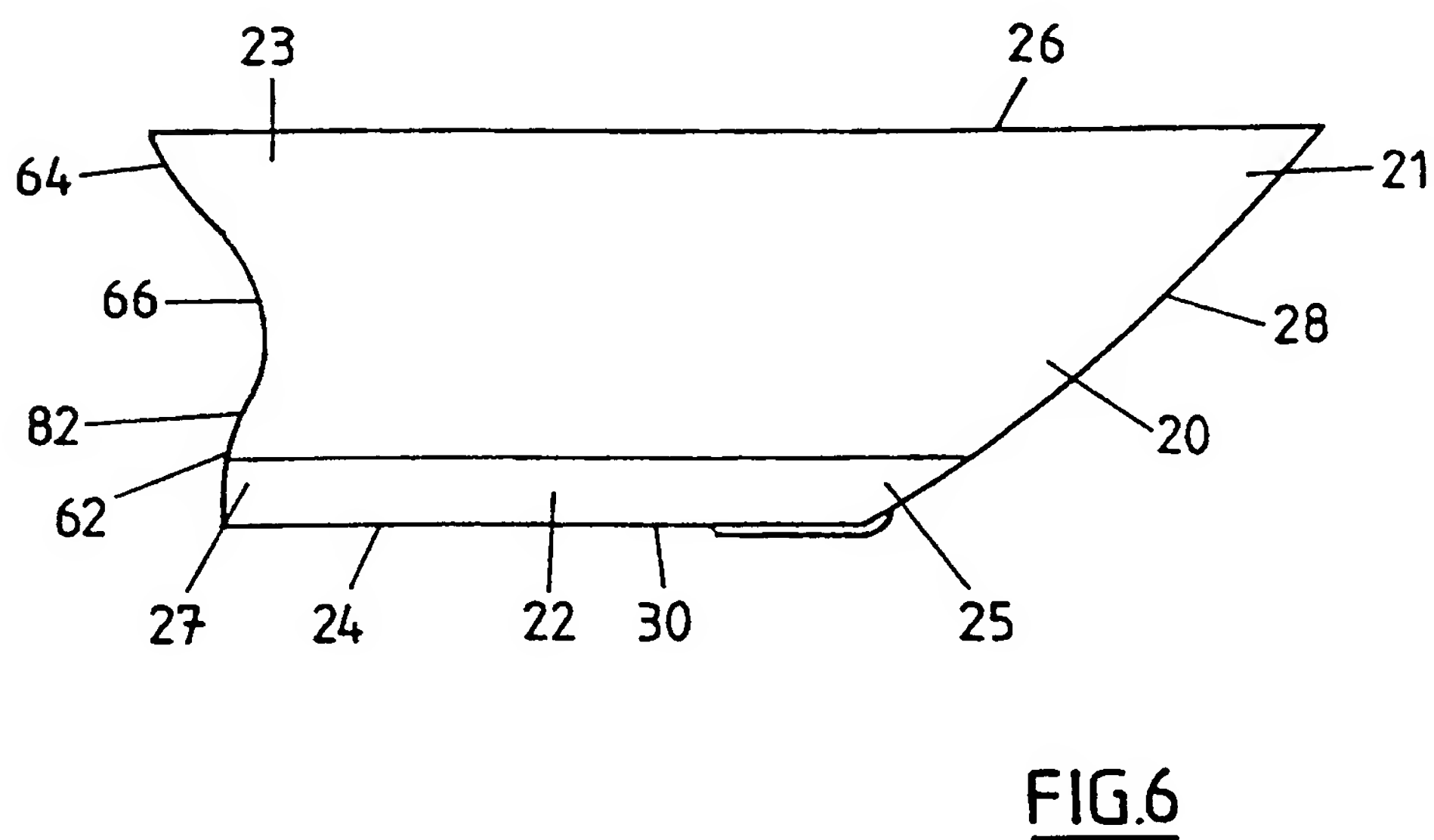
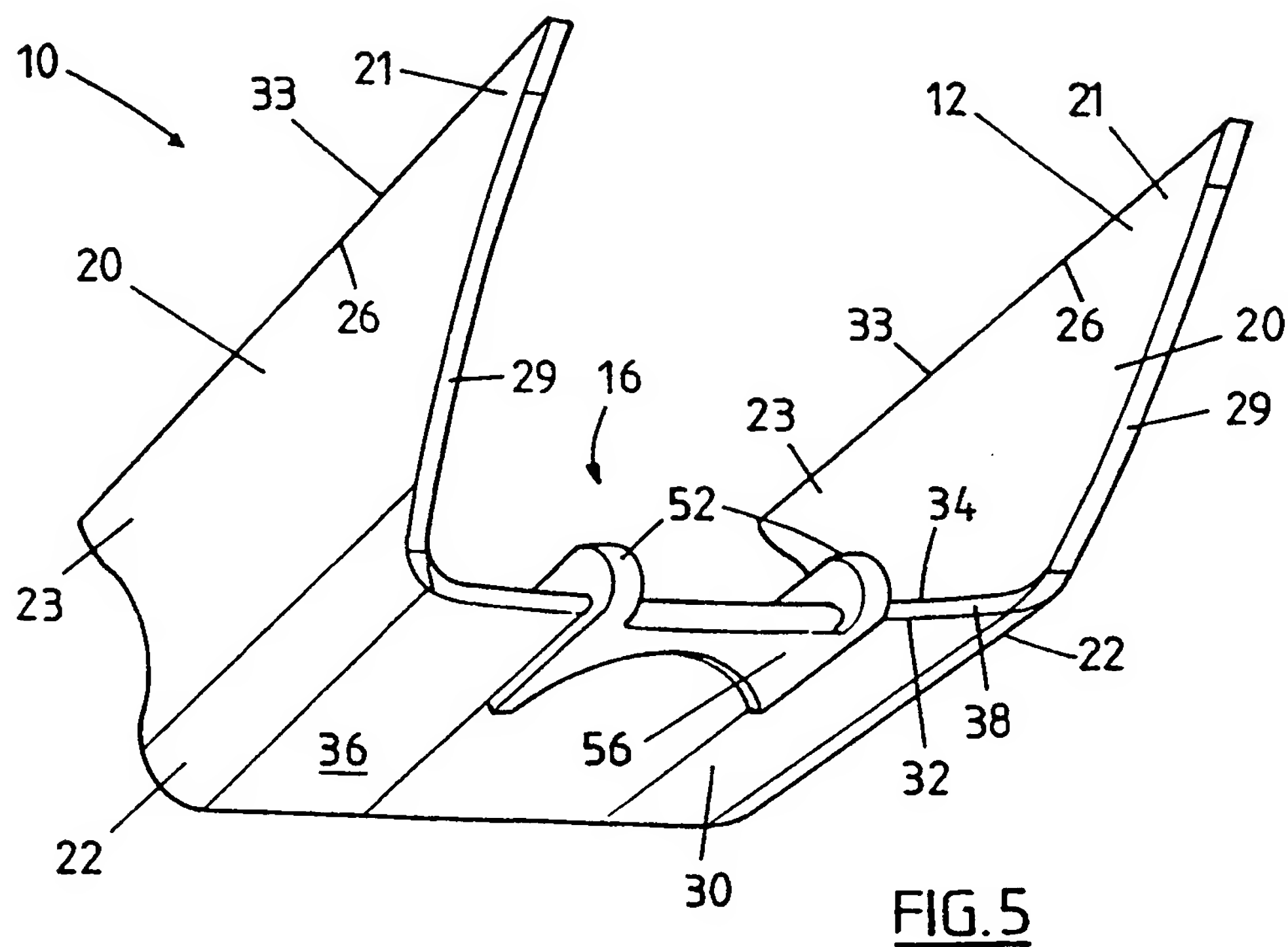


FIG.4



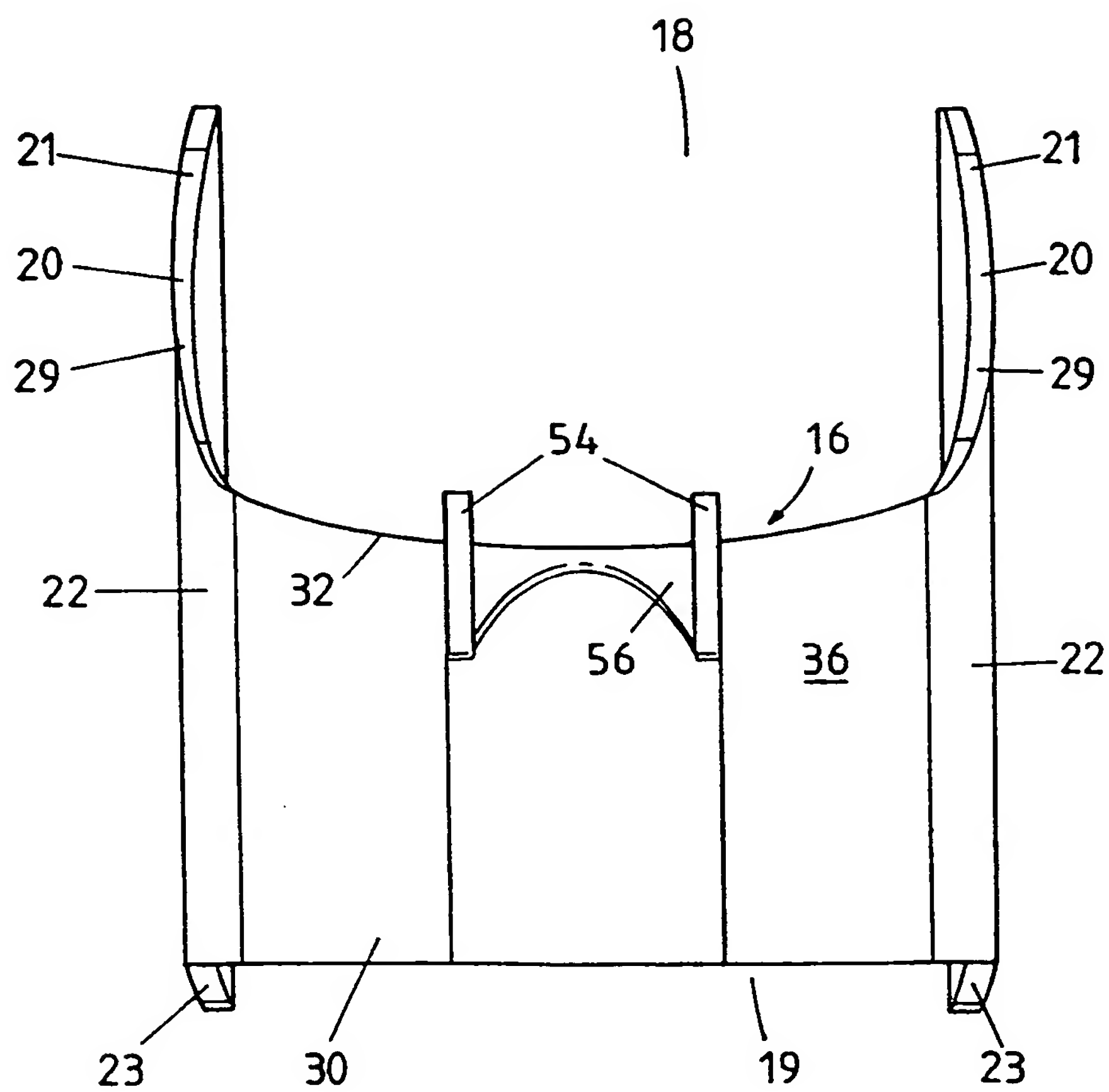


FIG. 7

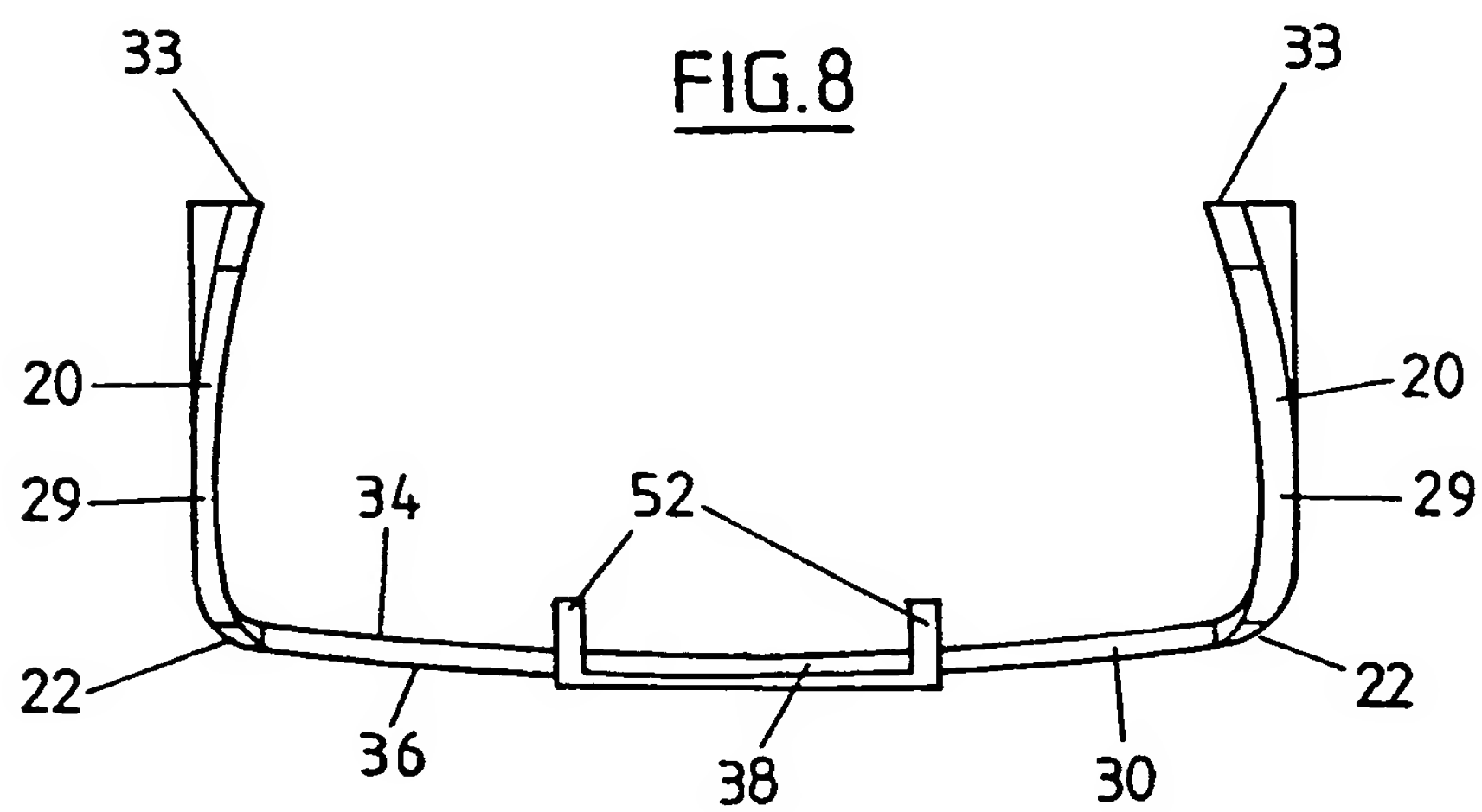


FIG. 8

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/AU 01/00144**A. CLASSIFICATION OF SUBJECT MATTER**Int Cl⁷: **B63B 35/79**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
IPC: B63B 35/79

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99/22986 A1 (PINKSTONE et al) 14 May 1999 Page 2, line 21 - page 4, line 15 and figs. 1 - 9	1-18
X	DE 2922860 A1 (RUPPRECHT) 18 December 1980 Figs. 2-4	1-6, 9-18
X	AU 31663/71 A (RICHARDS DESIGN PTY LTD) 1 February 1973 Figs. E, F and G	1-6, 9-18

☒ Further documents are listed in the
continuation of Box C☒ See patent family annex

* Special categories of cited documents:	
"A" Document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
17 April 2001Date of mailing of the international search report
30 APR 2001Name and mailing address of the ISA/AU
**AUSTRALIAN PATENT OFFICE
PO BOX 200
WODEN ACT 2606 AUSTRALIA
E-mail address: pct@ipaustalia.gov.au
Facsimile No.: (02) 6285 3929**

Authorized officer

SYLVAIN DESCHANEL
Telephone No.: (02) 6283 2368

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 01/00144

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 972196 A (ECROYD) 7 October 1964 Page 2, lines 107-117 and figs. 1-4	1-6, 9-18
X	US 3089157 A (MAY) 14 May 1963 Whole document	1-6, 10-18
X	DE 3016927 A1 (GOHRITZ) 5 November 1981 Figs. 1-2	1-6, 10-18
X	AU 84768/91 A (SAMPSON) 2 April 1992 Page 6, lines 6-8 and Fig. 1	1-6, 10-18
X	GB 2177353 A (RENNIE) 21 January 1987 Figs. 1-5	1-6, 10-18

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU 01/00144

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
WO	9922986	AU	10124/99
GB	2177353	AU	59430/86
END OF ANNEX			